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October 29, 2001

Mary L. Cottrell, Secretary Department of Telecommunications and Energy One South Station Boston, MA 02110

Re: D.T.E. 01-65 – Reliability Report NSTAR Electric

Dear Secretary Cottrell:

In accordance with the order of the Department of Telecommunications and Energy (the "Department") in the above-referenced proceeding, and in compliance with a letter dated August 10, 2001 from Chairman Connelly, Boston Edison Company ("Boston Edison"), Cambridge Electric Light Company ("Cambridge") and Commonwealth Electric Company ("Commonwealth") (collectively, "NSTAR Electric" or the "Company") hereby file an original and nine copies of NSTAR Electric's report on system reliability (the "Report"). The Report is a comprehensive examination that identifies and evaluates the circumstances of service outages during the past summer. The Report is based on a full-scale self-examination into the outages and three separate assessments conducted by independent consultants.

The Report includes both a review of the areas of inquiry raised by the Department in this case, as well as a summary of the measures that NSTAR Electric has planned or is implementing to improve system reliability. Voluminous appendices include the Company's internal review of its operations, as well as copies of the independent consultant reports.

Mary L. Cottrell, Secretary D.T.E. 01-65 – NSTAR Electric Reliability Report October 29, 2001 Page 2

Thank you for your attention to this matter. Please contact me if you have any questions regarding this submission.

Sincerely,

Robert J. Keegar

# Enclosure

cc: Chairman Connelly

Commissioner Keating Commissioner Vasington Commissioner Sullivan Commissioner Manning

Paul G. Afonso, General Counsel

David O. Connor, Division of Energy Resources Joseph W. Rogers, Assistant Attorney General

Charles Harak, Esq. William S. Stowe, Esq.

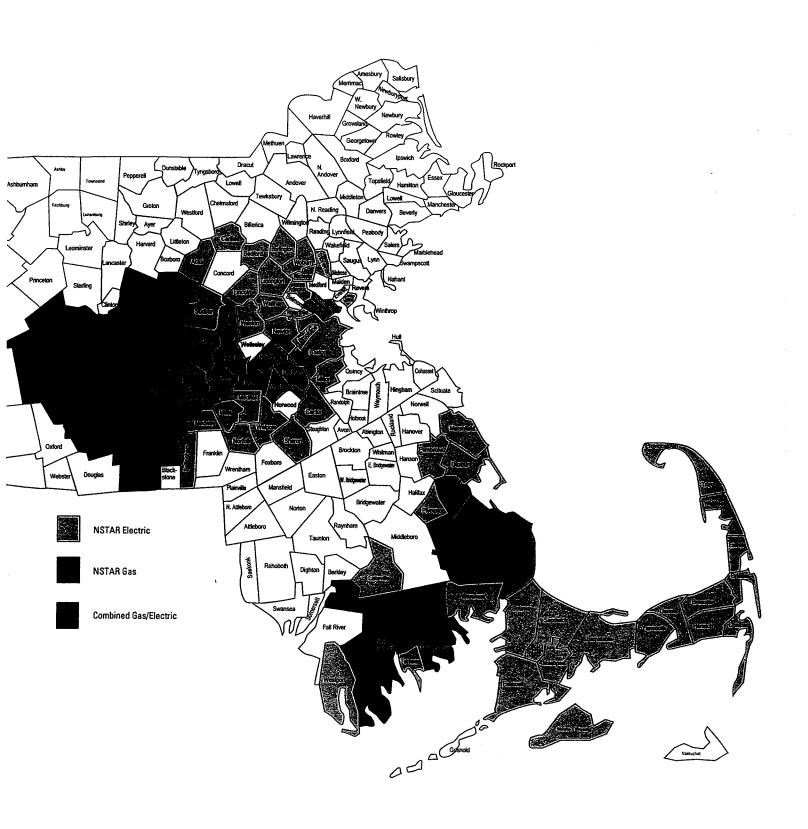
# NSTAR Electric Company Report to the Department of Telecommunications and Energy D.T.E. 01-65

Boston Edison Company Cambridge Electric Light Company Commonwealth Electric Company

October 29, 2001



# **NSTAR Service Territory**



#### **EXECUTIVE SUMMARY**

On August 24, 2001, the Department of Telecommunications and Energy (the "Department") opened an investigation into the service quality being provided by electric companies in Massachusetts. The Department commenced this investigation in response to a number of service outages that were experienced by electric customers throughout the Commonwealth of Massachusetts during July and August 2001. In light of those outages, NSTAR Electric initiated a full-scale self-examination to identify and evaluate the circumstances of the service outages on its system and to assess the overall quality of service being provided to its customers. This Report is designed to provide the Department with the results of the Company's examination into the service outages and the actions that the Company is taking to ensure that NSTAR Electric customers are provided with the high level of service quality to which they are entitled.

Recognizing that the system's performance is dependent on the interaction of a number of driving factors, including weather, load requirements, infrastructure conditions, information-system capabilities and operating practices and procedures, the Company designed its self-assessment process to include both internal and external components. To assess service-quality issues from an internal perspective, NSTAR Electric established the Internal Assessment Project to evaluate the reasons for the recent service outages, the capabilities and effectiveness of systems and processes involved in managing the outage process, and the restoration of service.

To obtain an independent assessment of the causes of certain specific service outages and the capabilities of the NSTAR Electric system from a design, planning, operating and maintenance perspective, the Company engaged several outside consultants with broad experience in the electric-utility industry. Specifically, NSTAR Electric retained ABB Consulting to perform a study of the overall distribution-system infrastructure. Second, the Company engaged KEMA Consulting to evaluate the outage-management process and related information systems. Lastly, the Company engaged Stone and Webster to investigate the root causes for three particular outages affecting customers in the City of Boston last summer.

The Company's service-quality data shows that, during the summer of 2001, there was a decline in service reliability on the NSTAR Electric distribution system, as measured by the System Average Interruption Frequency Index ("SAIFI") and the System Average Interruption Duration Index ("SAIDI"). The results of the Company's internal and external assessments into the reasons for this decline in service reliability are encompassed within the Department's areas of inquiry and show that the NSTAR Electric distribution system did not withstand a number of precipitating events, including increased customer loads, hot summer conditions and the incidence of severe summer storms. Specifically, the Company's internal and external assessments arrived at the following conclusions:

• Growth Forecasting: NSTAR Electric's planned loading levels and growth forecasts were not a factor in the recent outages, except with respect to a particular

area within the Town of Brookline where growth exponentially exceeded the Company's load forecast. The Company's assessments show that, in light of recent improvements, the Company is well-positioned going forward with respect to its growth forecasting techniques. In addition, there are no technical flaws in the planning standards used by the Company and its loading criteria and utilization ratios are in line with industry standards;

- Internal and External Communications on Outages: NSTAR Electric's efforts to manage communications with customers and municipal officials during this past summer were hindered by outage and restoration data issues. NSTAR Electric is implementing a number of measures designed to improve the flow and reporting of information during outage and storm recovery both internally and externally;
- Deployment of Equipment To Ease Service Interruptions: NSTAR Electric's plan for deployment of emergency equipment is reasonable, appropriate and consistent with industry practice;
- Personnel Availability During Outage Events: NSTAR Electric identified certain gaps in its existing policies and guidelines with respect to staffing schedules in the event of weather emergencies. In July, NSTAR Electric instituted a series of measures to remedy the identified gaps and to ensure the availability of personnel during these events. Therefore, personnel availability was not a factor in any of the outages experienced on the NSTAR system subsequent to the July 4<sup>th</sup> holiday;
- Maintenance Practices and Spare Inventory: NSTAR Electric has identified a need to ramp up its inspection and repair and maintenance efforts. NSTAR Electric has already implemented a number of measures designed to eliminate corrective and preventive maintenance backlogs and to accelerate infrastructure improvements in a number of "hot-spot" areas within the NSTAR Electric service territory, including the City of Boston, the Town of Brookline and a number of other key areas. In addition, NSTAR Electric identified that the integration of new information systems with operating practices is incomplete. Therefore, NSTAR Electric has instituted a number of measures designed to complete the integration of systems and procedures. The availability of spare parts was not a factor in the recent outages;
- **Distribution System Design:** There are no fundamental technical flaws in the design of the distribution system, nor in the planning standards and guidelines that guide the Company's operation of the system;
- Accuracy of Weather Forecasting: The Company's weather-forecasting practices were not a factor in the recent outages. NSTAR Electric relies on multiple resources to monitor and evaluate weather conditions. Since there will always be a level of uncertainty associated with weather forecasts, NSTAR Electric has in place a Storm Restoration Plan that is triggered when weather contingencies arise. The Company is working to adjust the plan to be more responsive to the occurrence of localized events.
- Adequacy of Field Staffing Levels: NSTAR Electric has determined that field staffing levels were not at an optimal level this past summer. In recent years, a significant level of field staff has been diverted to meet an unusually high level of

interconnection activities associated with new generation facilities, congestion mitigation projects and new customer connections. Staffing resources have now been directed to maintenance activities with the objective of eliminating current maintenance backlogs by the end of the year. In addition, the Company has implemented a number of measures to increase its available resources, including hiring and training new employees in operational areas, increased use of outside contractors, overtime, and more efficient utilization of existing personnel and information systems;

- Employee Training Programs: The Company's electric-operation training programs were not a factor in the recent outages. NSTAR Electric conducts a comprehensive training program for company personnel in the areas of system maintenance and storm restoration. However, NSTAR Electric is working to improve its information-systems training program to ensure that employees are efficiently and effectively using new information systems to the maximum capability;
- Cost Benefit Assessment of Periodic Inspections: NSTAR Electric has a periodic inspection program that is supported by a cost/benefit analysis.

Based on the evaluations of both the internal and external assessment teams, as well as input from customers and municipal officials, NSTAR Electric has undertaken a number of initiatives to increase the overall reliability of the NSTAR Electric system and to enhance the Company's restoration capabilities and communications processes. NSTAR Electric has already substantially implemented the changes necessary to resolve the electric-system performance issues that were identified. This report is designed to provide the Department with insight into the results of the evaluation process and to report on the Company's plan of action to improve service reliability. In that regard, NSTAR Electric is committed to a course of action that will build consumer confidence in the NSTAR Electric system and ensure a high level of service reliability in the future.

#### **NSTAR ELECTRIC**

### REPORT TO THE DEPARTMENT D.T.E. 01-65

# I. Introduction

On August 24, 2001, the Department of Telecommunications and Energy (the "Department") opened an investigation into the service quality being provided by NSTAR Electric<sup>1</sup> (or the "Company"), which was docketed as D.T.E. 01-65.<sup>2</sup> The Department opened the investigation in response to a number of service outages that were experienced by electric customers in the Commonwealth of Massachusetts during the months of July and August 2001. The Department's order opening the investigation followed a letter to the Company from Chairman Connelly that directed the Company to undertake an examination of the underlying causes for the distribution system outages experienced during that period, a diagnosis of any operational or physical problems in the distribution system, and a plan to reduce or, where feasible, eliminate the risk of recurrence. Letter to Thomas May from James Connelly, Chairman (August 10, 2001). The Department stated that the investigation would also focus on NSTAR's procedures to alert consumers of significant electricity outages. Id.

At the time that the Department issued its letter directive, NSTAR Electric was already in the midst of a full-scale examination into the circumstances of the recent service outages, the capabilities and effectiveness of systems and processes involved in

NSTAR Electric is composed of three electric distribution companies: Boston Edison Company, Cambridge Electric Light Company and Commonwealth Electric Company.

The Department also initiated proceedings for the other electric distribution companies operating in the Commonwealth of Massachusetts, which were docketed by the Department as follows: Western Massachusetts Electric Company, D.T.E. 01-66; Fitchburg Gas and Electric Light Company, D.T.E. 01-67; and Massachusetts Electric Company, D.T.E. 01-68.

managing the outage process, including communications with customers and municipal officials, and the restoration of service. The Company's principal objective in undertaking its self-examination was to assess the performance of the electric system and to identify opportunities for improving the level of service reliability experienced by customers. The Company accomplished its self-examination using both internal and external resources, and as a result of these efforts, NSTAR Electric has launched a series of initiatives to improve the efficiency and effectiveness of the system infrastructure, business processes, information systems and people that work together to deliver reliable service to customers. This Report is designed to provide an overview of the results of NSTAR's examination and to outline the Company's plan to achieve its objective of improving the reliability of service.

In opening its service-quality investigation, the Department enumerated 10 areas of inquiry to be evaluated by electric companies in reporting to the Department on service-quality issues.<sup>3</sup> Therefore, in addition to reporting on the results of the Company's comprehensive self-examination, this Report also responds to the Department's particular questions on system performance. Section II of this Report provides a brief overview of the Summer 2001 outage events. Section III describes the scope and design of the Company's internal and external assessment effort and Section IV addresses each of the areas of inquiry raised by the Department. Section V summarizes the measures that NSTAR Electric has planned or is implementing to improve the reliability of the overall system.

In its initial order, issued on August 24, 2001, the Department articulated seven areas of inquiry. By letter dated September 12, 2001, the Department directed electric companies to include three additional areas, for a total of ten.

#### II. Overview of Summer 2001 Outages

During the summer of 2001, the NSTAR Electric system experienced a number of service outages, some of a significant duration. NSTAR's performance in this area is captured by the Department's service-quality performance measures, which are the System Average Interruption Frequency Index ("SAIFI") and the System Average Interruption Duration Index ("SAIDI"). The Company's system assessment shows that its performance during the summer of 2001 fell below historical levels for both SAIFI and SAIDI.<sup>4</sup>

Although the precise combination of factors leading to any particular service outage differed among outages, NSTAR Electric has determined that the vast majority of outages were precipitated by the occurrence of unusually severe summer storms and lightning strikes, hot summer conditions and unexpectedly high load growth in certain concentrated areas. As set forth in this Report, the Company has identified a number of actions involving system infrastructure, business processes, information systems and people that will be taken to significantly improve the distribution system's flexibility to withstand and respond to such circumstances in the future. These initiatives are discussed in response to the Department's system-performance questions and are summarized in Section V of this Report. In addition, these initiatives are detailed in the

On this date, NSTAR Electric and NSTAR Gas have filed reports on their service performance for the first two years after the merger that created NSTAR. The reporting period for that filing ended on August 31, 2001, and therefore, the Company's SAIFI/SAIDI performance statistics of this past summer are included in those calculations.

Attachment 1 to this Report identifies the performance drivers associated with particular outages in key areas within the NSTAR Electric service territory, which experienced a significantly higher than normal occurrence of outages. Attachment 1 also lists the remedial actions that the Company has taken or has underway to address reliability issues in those targeted areas.

Descriptive Overview of the Internal Assessment Project (set forth as Appendix A), which was commenced by NSTAR Electric senior management in July 2001.

# III. NSTAR Electric: System Assessment Initiatives

In July 2001, NSTAR Electric was faced with a discernible increase in the frequency and duration of service outages in certain areas of its distribution system, which was causing significant concern for customers, public officials and the Company. Given the frequency and duration with which outages were occurring, and because the outages could not be easily attributed to a single cause or set of circumstances, the Company moved quickly to initiate an in-depth examination of the operational areas involved in service reliability and the outage-management process.

Recognizing that the performance of the electric system is dependent on the interaction of a number of driving factors, including weather, load requirements, infrastructure conditions, information-system capabilities and operating practices and procedures, the Company designed its assessment process to be multi-faceted and to include both internal and external components. The central focus of the Company's self-examination process was the Internal Assessment Project, which was initiated in July 2001, shortly after NSTAR Electric began to experience repeated customer outages on its system. The Internal Assessment Project consisted of seven teams that were specifically directed to perform a candid self-critique of the key function areas within the Company that have direct involvement with service reliability and outage-response activities. The internal teams also focused on a number of customer-service related issues that, although not direct contributors to recent events, represent performance issues subject to the

Department's service-quality requirements. Thus, the seven teams established to evaluate service-delivery issues were the following:

- Electric System Infrastructure;
- Reliability Data Collection and Reporting;
- Restoration Capabilities;
- Communications;
- Call Center;
- Information Technology; and
- Staffing

The charter of the Internal Assessment Project was to perform a focused, diagnostic assessment of the contributing factors to the service outages and of the Company's related restoration efforts. The assessment teams were directed to uncover potential shortcomings based on then-existing processes, information-system capabilities and resource allocations and to recommend potential corrective actions. In identifying potential corrective actions, the assessment teams were not asked to consider or account for pending changes or improvements in information-system capabilities, business processes or resource allocations in other areas of the Company. From a corporate perspective, this effort was designed to enable senior management to evaluate a broad range of recommended actions outside of the context of its traditional business-planning process and then to integrate those recommendations into an improved operational plan for the near and long-term. The resulting operational plan has a strong focus on electric

system performance and customer service, and balances the resources, anticipated productivity improvements and performance capabilities of the overall organization.<sup>6</sup>

In addition to its internal assessment efforts, NSTAR Electric retained the services of three independent consultants to evaluate electric-system performance. ABB Consulting ("ABB") was retained to perform an overall assessment of the Company's distribution system and its restoration practices. ABB focused on four areas: (1) events and history; (2) planning and design; (3) operations; and (4) restoration. In each of these four areas, ABB investigated the factors generally involved in the outage events, the interaction between factors and the degree to which those factors affected operations. ABB also assessed the needs and capabilities of the distribution system. The final report of ABB Consulting is set forth at Appendix B.

The Company also engaged KEMA Consulting and GeoIT (together, the "KEMA Team") to evaluate and suggest improvements for the Company's outage-management process and procedures. The outage-management process that was evaluated by the KEMA Team begins with the first awareness of an unplanned outage, or the issuance of advance notifications for a planned outage, and ends with the restoration of service to customers, the issuance of work orders for corrective measures, the conclusion of customer communications and the updating of applicable records. The final report of the KEMA Team is set forth at Appendix C.

Lastly, NSTAR Electric retained the services of Stone & Webster to perform an in-depth engineering analysis of the root causes of three particular high-profile outages within the City of Boston. These outages were: (1) the Mystic outage on July 12, 2001

As indicated above, a Descriptive Overview of the Internal Assessment Project is set forth as Appendix A.

(Station No. 250); (2) the Kenmore Square area outage on August 9, 2001 (Station Nos. 49 and 492); and the Brighton outage on August 9, 2001 (Station No. 329). The final report of Stone & Webster is set forth in Appendix D to this Report.

The Company's responses to the Department's system-performance questions reflect the findings of the Internal Assessment Project, ABB, the KEMA Team and Stone & Webster. Collectively, these assessments have provided NSTAR Electric with a sound analytical basis for developing and implementing electric system improvement plans. Most importantly, the depth and breadth of the Company's internal and external assessments have enabled senior management to develop a performance-oriented action plan that not only responds to the particular events experienced this past summer, but also positions the Company to provide a higher level of service to all customers throughout the NSTAR Electric service territory in the future.

# IV. Response to the Department's System-Performance Questions

A. Adequacy of Growth Forecasting at the Community, Business District, or Neighborhood Level, and Suggested Areas of Improvement

The NSTAR Electric planning process involves two primary components: (1) a load forecast of expected load growth over a defined period (typically 10 years); and (2) an evaluation of equipment capacity available to serve both projected load levels and load levels that occur under adverse outage conditions. The results of the Company's internal and external assessments show that there are no technical flaws in the planning standards used by the Company and that its loading criteria and utilization ratios are in line with industry standards.

In the past year (and prior to the recent outages), NSTAR Electric has taken a number of steps to improve its long-range load-forecasting process. Historically,

NSTAR used a projected system-wide growth rate in formulating load forecasts and applied this rate in a uniform manner across the transmission and distribution ("T&D") system. Beginning in 2001, NSTAR Electric is utilizing a small-area spatial load forecast to determine growth rates on a geographic basis. The process uses land-use data on an area-by-area basis and considers load growth spurred by specific, significant development projects. This will result in a more accurate load forecast for each individual substation and the distribution feeders associated with each substation.

With respect to loading levels, the Company's planning process focuses on maintaining adequate capacity of equipment over the projected future load conditions for each segment of the T&D system. Each segment of the T&D system is evaluated with consideration of its character and performance to ensure that customer load can be reliably served under reasonably foreseeable equipment-outage conditions, and that when outages occur, outage duration is minimized. For example, during the summer of 2001, the NSTAR Electric system peak was approximately 12 percent higher than its previous system peak in 1999, which resulted in the system experiencing higher-than-expected equipment loading across the system. During this time, however, no interruptions occurred as the result of a lack of substation capacity.

Although the planning process generally was not a factor in the recent outage events, NSTAR Electric is working to implement a number of improvements to its load-forecast and planned-loading-levels analysis. These improvements include the establishment of peak-demand sensitivity to weather extremes and the development of specific load-response characteristics experienced by equipment during those extremes. The Company is also in the process of implementing CYMEDIST distribution load-flow

analysis software, which will assist engineers in performing: (1) primary distributionsystem planning, operation and optimization studies; (2) per-phase voltage drop calculations; (3) fault calculations; (4) load balancing and load-allocation studies; and (5) line switching, load transfer and reconductoring studies.

It is important to note that the adoption of the small-area spatial load forecast to determine growth rates on a geographic basis should limit the potential for a recurrence of the situation that the Company faced in certain areas of the Town of Brookline this past summer. Although the Company's planning process generally did not play a role in the summer outages, there were areas in the Town of Brookline, in particular, that experienced growth rates that were well beyond the levels anticipated by the Company's load-growth forecasts (which were formulated using the prior, system-wide planning approach). The implementation of the new approach will improve the Company's forecasts in such areas in the future.

- B. Appropriateness of Communications and Notification Procedures (Including Accurate and Real-Time Updates) During Outage and Storm Recovery, Both Internal to the Company and Between the Company and Municipalities, Affected Neighborhoods, Political Leaders and Regulators
  - (1) INTERNAL PROCESSES AND COMMUNICATIONS ON OUTAGES

The efficient flow of information regarding outage events and ongoing restoration efforts both internally and externally is a critical component of the Company's outage-management process. Since 2000, NSTAR Electric has invested approximately \$144 million in the implementation of major information systems that are designed to support the Company's business processes and to increase the efficiency and effectiveness of the Company's operations across its service territory. These systems include the Customer

Information System ("CIS"), the work-management system and the outage-management system (described below as "M3i").

A specific example of a key improvement that will be enabled by the implementation of new technology, is the outage-management process. The outage-management process involves a number of interlocking systems components, databases and business processes that function together to facilitate the collection and reporting of outage data and related activities. The Company is currently migrating the systems applications that now support the outage-management process to a single, highly integrated and broadly functional outage-management system, known as M3i. The M3i system is state-of-the-art technology that will enable a wide range of productivity improvements.

When the M3i system is fully implemented it will significantly automate the trouble-reporting system, improve the accuracy of outage reporting statistics, allow for more accurate and timely flow of information to the call center, dispatch and other areas of the Company relying on outage information, and will provide a facility to more efficiently accomplish a range of outage-related processes. The M3i system has the capability to integrate with a number of complementary systems, including the CIS, the Geographic Information System and the SCADA systems. Thus, the M3i system is an important tool in ensuring that accurate outage and service-restoration data is available to support restoration activities.

Given the scope of capabilities of the M3i system and the number of systems with which it interacts, the implementation process must be accomplished in phases over a

Attachment 2 illustrates the Company's "to be" outage-management process, which will serve as the basis for the Company's improvement plans going forward.

multi-year time period. The Company currently is in the second year of the implementation process and expects to complete the current phase on the Boston Edison system by April 2002. Each phase of implementation must be coordinated within the broader information-systems context and with a minimum of disruption to the ongoing operations of the Company. In addition, the implementation effort also involves the development of standardized business processes and the establishment of procedures to ensure the quality of data being input to the system and the efficient and effective use of the system. In short, the implementation of a system such as the M3i system is a complex and time-consuming undertaking involving many judgment calls, implementation pitfalls and unanticipated hardware and software issues.

The Company's internal and external assessments show that a number of implementation issues were raised with respect to the quality and timeliness of historic outage data, the availability of outage and restoration information during outage events, and adherence to necessary business processes during those time periods. All of these factors affected the Company's ability to process information internally, and as a result, to manage outage events externally.

Therefore, NSTAR Electric is implementing a number of measures designed to improve the flow of information during outage and storm recovery. Issues will be largely addressed through the advancement of system-integration efforts and the development and standardization of written procedures that are designed to align the business process with information-system capabilities. As detailed in the Descriptive Overview of the Internal Assessment Project, the Company has undertaken a number of measures (both completed and underway) to remedy identified performance gaps relating to the internal

flow of outage information. Attachment 3 to this Report sets forth the following: (1) a representation of the Company's overall multi-year information-systems plan, showing existing system interfaces (Attachment 3A); (2) a representation of the business-process maps that were used as a basis for developing work plans for several of the Internal Assessment Teams (Attachment 3B); and (3) a representation of the business processes mapped to existing and planned information systems (Attachment 3C). The Company has also identified a need to develop user-friendly interfaces for employees to assist in the design and production of data reports. Lastly, the Company has initiated an effort to reshape its employee-training approach with respect to the new information systems and the business processes that support those systems.

As a result of these efforts, NSTAR Electric will substantially improve its internal processes and capabilities relating to the flow and accuracy of outage data. Increasing the accuracy and timeliness of reliability data will, in turn, facilitate improvements in other areas of the Company that rely on this data for planning or operational purposes. For example, the Company's annual preventive-maintenance plan is formulated, in part, based on reliability data, which provides an indication to the Company of the areas that require special attention. Therefore, improvements in the internal flow and accuracy of the outage data will have a significant effect on the Company's reliability efforts and will enable external communications, as discussed below.

## (2) EXTERNAL PROCESSES AND COMMUNICATIONS ON OUTAGES

The Company's overriding business objective is to serve customers safely, reliably and at a reasonable price. A critical focus of the Company's efforts to meet its service obligation is the cultivation of relationships with customers and their

representatives, which include municipal officials and other public authorities. The Company devotes a significant amount of time and resources to this effort. The Company's efforts take a number of forms including community giving and outreach programs, customer education, low-income discount and fuel assistance outreach efforts, school programs, conservation programs, dissemination of electric and gas safety information and volunteerism, which is strongly encouraged by senior management.

The Company also has in place a number of processes and operating procedures to notify municipal officials of the existence of service outages under conditions that trigger the Company's Storm Restoration Plan (the "SRP"). These operating procedures are provided as Attachment 4 to this report. The Company's SRP is provided as Appendix E.

During the past few months, the Company has improved its existing communications plans to ensure that customers and their representatives, including municipal officials receive outage information on a timely basis. For example, the Company is establishing new procedures to trigger communication processes in certain non-SRP situations. In addition, the Company has undertaken the following community outreach activities:

- The Company has developed key contact lists and contact information for each city and town within its service territory;
- The Company has mailed letters to each community establishing an outagecommunication procedure to alert municipal officials of an outage within their city or town;
- The Company has personally contacted representatives from each city or town within the NSTAR Electric service territory to review this procedure and to discuss any concerns or questions that municipal officials may have regarding the Company's outage management process;
- The Company has fulfilled all of its requirements with respect to the reporting of outage information to the Department;

- On September 21, 2001, the Company met with representatives of the Mayor of Boston to outline a plan to accelerate certain infrastructure improvements within the City of Boston. The Company's plan established a communications protocol for contact between the City of Boston and the Company at both the executive and operating levels;
- The Company has conducted a series of meetings with officials in the Town of Brookline and other municipalities to discuss system-performance issues and infrastructure improvements.
- The Company has initiated a community advertising campaign to announce infrastructure projects in certain areas and to update customers on the status of the Company's improvement efforts. Examples of these communications are provided as Attachment 5A;
- The Company has prepared and distributed a bill insert to inform customers about service outages and the technology changes that will serve them in those situations. A copy of the bill insert is provided as Attachment 5B;
- On October 24, 2001, the Company conducted a symposium to educate municipalities on tree-trimming practices and the need to minimize interference with overhead distribution-system facilities. A copy of the symposium invitation is included in Attachment 5C.

In addition, the Company conducts annual meetings with emergency response personnel in the cities and towns that the Company serves to provide an update on changes to the Company's SRP. All of these initiatives are designed to augment existing practices and procedures and to ensure that the Company maintains a cooperative and productive relationship with its external constituencies.

C. Aptness of Plans to Deploy Emergency Generators and Other Equipment to Restore Critical Service or Ease Prolonged Interruptions

NSTAR Electric has emergency generation equipment available to assist in maintaining or restoring electric service in emergency or life-threatening situations. In addition, NSTAR Electric works proactively with local communities and critical-care customers to facilitate the installation of customer-owned emergency supply equipment. Specifically, NSTAR Electric maintains four mobile, engine generators, which are: (1) a three-phase 100kW unit; (2) a single-phase 100kW unit; and (3) two combination-phase

320kW units. The Company also maintains two portable pad-mount transformers, including: (a) a single-phase 100kVa unit; and (b) a three-phase 300kVa unit. In addition, the Company has access to other units that can be brought in should the circumstances of the situation require. When an outage occurs on the electric distribution system, the Company evaluates the use of temporary electrical supply options, such as portable pad-mount transformers and mobile, engine generators. This evaluation is designed to balance the feasibility of restoring critical loads using temporary means, the time required to connect and remove the temporary means and the impact of the diversion of resources to initiate temporary service on the overall restoration time for other affected customer loads, including non-critical loads.

It is NSTAR Electric's policy to consider all reasonable means to alleviate or minimize impacts associated with planned outages for system upgrades or repairs. In addition, NSTAR will work proactively with communities and critical care customers to provide technical advice and direction for the installation of customer-owned emergency supply equipment. Thus, the Company's procedures relating to the deployment of emergency generation equipment are reasonable, appropriate and consistent with industry practice.

D. Soundness of Personnel Availability and Work-Crew Call Up and Deployment Procedures

NSTAR Electric has determined that, in SRP situations, the Company's well-established procedures are effective in assembling the necessary and appropriate personnel to restore service and manage the outage process. Similarly, the Company's personnel procedures in responding to brief, localized outages are well-established and effective. NSTAR Electric has determined that, in certain non-SRP situations that fall in

between these two response situations, enhancements to existing procedures are necessary to ensure that adequate personnel are on hand to address system issues. NSTAR Electric has already instituted a series of measures to remedy the identified gaps under those circumstances and to ensure the availability of personnel during these events. As a result of these efforts, personnel availability was not a factor in any outages subsequent to the June 30<sup>th</sup> and July 1<sup>st</sup> storm events.

NSTAR maintains "first responder" or troubleshooter coverage on a 24-hour, seven-day basis across the distribution system. Line crews normally work on a weekday schedule. During non-weekday hours when a problem on the distribution system cannot be repaired by a troubleshooter, or a combination of troubleshooters, line crew personnel are called in to repair the problem. In the vast majority of cases, troubleshooters are able to restore service to customers. In those cases requiring a crew, the division on-call supervisor is notified by the System Dispatch group that a crew is required and the supervisor initiates the call-in. The crew reports to the service center to get their equipment and then reports to the trouble location. In the past, this process has worked well.

During the storms of June 30<sup>th</sup> and July 1<sup>st</sup>, the Company experienced an abnormally low response rate to the call-in process. Because of the holiday weekend, there were a large number of line personnel who did not respond to the Company's calls to their homes. Since the storms were not forecast, no advance arrangements had been made to assure a response to weekend call-ins. The Company has taken several actions to help ensure that this situation is not repeated. First, in recognition that holiday weekends can present unique issues with respect to worker availability, the Company has

instituted a practice of scheduling routine planned work for holiday weekends and of recruiting line workers to work on weekends on a planned basis. If there are system problems, these crews can be redirected to restore customer service. This also increases the availability of crews for off-hour call-ins.

Secondly, the Company now pre-polls employee availability for the weekend period. This provides an indication of the number of employees that may be available if needed in off hours. Third, the Company now pre-polls contractor line forces to determine their availability, proximity and location of equipment. This provides an indication of resource availability and of the Company's ability to formulate a rapid response. The Company will call in contractors as needed to supplement its line workforce and has now established contracts for this purpose. Lastly, the Company will turn to neighboring utilities for mutual assistance. This process is carried out at the point that damage is known, because the responding utility will not generally commit to providing assistance until it is sure that there is no threat or damage to its own system.

The Company implemented changes to its work-crew call-in procedures shortly after the outages experienced on June 30<sup>th</sup> and July 1<sup>st</sup>, which coincided with the July 4<sup>th</sup> holiday. Since that time, the Company has not experienced any difficulty in maintaining sufficient personnel availability to meet system requirements or in calling up work crews. The Company will continue to monitor the situation and is prepared to make additional changes to its procedures should circumstances warrant.

E. Adequacy of Overall and Particular Community Maintenance Practices and of Equipment and Spares to Meet Outage-Restoration Demands

There are two types of maintenance activities that are undertaken by NSTAR Electric, i.e., preventive and corrective maintenance. Preventive maintenance is carried

out primarily through the inspection process. Corrective maintenance involves the repair or replacement of equipment, which is identified through the preventive maintenance process or as a result of equipment failure. A proactive preventive-maintenance plan can help to lower operations and maintenance expenses because overhead expenses associated with outages are reduced, incremental labor costs are unnecessary, and costs of replacement parts and material inventory are eliminated. In addition, an effective preventive-maintenance program improves system capacity and reliability and decreases the time that system components are out of service.

The Company's Preventive Maintenance Program ("PMP") includes predictive, periodic and planned activities, which are performed to improve equipment reliability, availability and safety requirements. The PMP is established based on a set of preventive maintenance guidelines for each category of equipment that is involved in the plan. Maintenance activities covered by the PMP involve the following:

- ◆ Predictive Maintenance involves condition-monitoring activities, such as oil analysis, infrared monitoring, in-service inspections, electrical diagnostic testing, equipment operations and observations taken to analyze, trend, and predict equipment parameters so that planned actions can be taken to correct abnormalities before equipment failure.
- ◆ Periodic activities, such as lubrication, cleaning, testing, calibration, inspection and filter changes are performed on a calendar-time, number of cycles or run-time basis to minimize equipment breakdown. Failure finding activities are a form of periodic activities. These are the least desired type of preventive maintenance because they do not improve the performance of the equipment. These activities simply verify that the component will function when the PM is performed.
- Planned activities, such as overhaul, contact replacement or oil changes are performed prior to equipment breakdown when identified by predictive or periodic activities. Planned activities are not performed on a time-directed basis.

The Company's preventive maintenance program for transmission and distribution activities is attached as Appendix F.

It should be noted that an important aspect of the Company's PMP is tree trimming. Tree trimming is critical to the reliability of the electric-power delivery system because the overhead delivery lines and circuits of the distribution system are located along most streets in close proximity to trees. Many of the overhead circuits contain uninsulated conductors that make the circuits more prone to tree-related outages. Therefore, ensuring that trees and other vegetation is kept away from the overhead lines is critical to maintaining system reliability. In that regard, the vegetation-management process employs the services of certified arborist to address issues of vegetation management. The process involves the development of a profile of the vegetation surrounding the wires and an aggressive trim profile that can provide the desired results for circuit reliability and yet maintain the aesthetics of the affected areas.

In order to ensure the validity of the PMP, the Company has in place a preventive-maintenance optimization ("PMO") process to evaluate whether the overall objectives of the PMP are being achieved. The PMO process is designed to ensure that the appropriate preventive maintenance action is performed on the appropriate equipment at the right time and with the right frequency. The PMP and PMO processes are discussed in Appendix F.

Each year, NSTAR Electric establishes a preventive-maintenance schedule for designated system components in accordance with the PMP. The Company's preventive-maintenance efforts focus on areas in which the Company has observed a system need, which is indicated by outage data compiled by the Company. System-maintenance needs are prioritized through the application of defined criteria, which include the number of customers affected, capacity utilization in the area and outage history. NSTAR Electric's

internal and external assessment teams confirmed that the design and content of the Company's preventive-maintenance schedule and the underlying PMP and PMO processes sufficiently address system-reliability issues. In addition, the Company evaluates the availability of spare parts on a periodic basis and has determined that availability of spare parts was not a factor in the recent outages.

The Company's assessments did, however, identify two key areas in need of improvement. First, the assessments indicated that outage data underlying the Company's maintenance schedule were incomplete and inadequately reported. As a result, in some instances, the Company did not properly allocate resources to problematic areas that were not represented in the outage reports. Second, the assessments indicated a need to re-prioritize and ramp up the Company's preventive and corrective maintenance activities to ensure completion of the 2001 preventive-maintenance schedule and to eliminate a backlog in corrective maintenance activities.

Accordingly, NSTAR Electric has already implemented a number of measures aimed at addressing the system-maintenance issues identified by the assessment teams. Two primary initiatives undertaken by the Company include: (1) the elimination of corrective and preventive maintenance backlogs through the re-prioritization of work schedules and reallocation of system resources; and (2) the acceleration of infrastructure improvements in a number of key "hot-spot" areas within the NSTAR Electric service territory, including the Town of Brookline and the City of Boston. The Company has also increased electric-system inspections, which is a key element of the PMP, and initiated efforts to better identify preventive and corrective maintenance requirements and to prioritize those needs in the future

With respect to the acceleration of infrastructure improvements in "hot spot" areas, the Company delivered to the City of Boston a plan to complete priority infrastructure improvements (the "Infrastructure Plan") within the City of Boston (September 21, 2001). The Infrastructure Plan establishes a two-tracked approach to complete infrastructure improvements on an accelerated basis. Specifically, the Infrastructure Plan identifies 11 high-priority system improvement projects in six neighborhoods that will be completed by June 2002 and identifies 33 additional projects within 14 neighborhoods that will be completed on an accelerated basis.

Although these projects do not represent the entire universe of initiatives that the Company will undertake to mitigate the potential for a recurrence of this summer's outage experience, these projects are specifically designed to increase system capacity and reliability on a city-wide basis. Specifically, the 44 projects set forth in the Infrastructure Plan involve the installation of new conduit, manholes, cables and equipment consistent with a new system design that is intended to increase the reliability of service for customers. For example, system capacity will be enhanced through the expansion or replacement of substations and the establishment of new supply circuits. The Company will also upgrade or install new larger-capacity supply lines circuits to increase capacity in particular areas, thereby reducing the load on existing circuits.

With respect to reliability improvements, the identified projects are designed to upgrade and modernize existing distribution facilities through the following activities:

(1) the replacement and upgrade of obsolete equipment, such as switches, circuit breakers, relay systems, wire, cable and other equipment; (2) the installation of automated switching devices to improve service restoration by providing a way for

dispatchers to restore power to customers from a remote locations; (3) the installation of system-monitoring equipment to enable dispatchers and engineers to monitor the performance of specific distribution facilities and take actions before issues arise to the extent possible; and (4) the installation of conduit and manhole systems to replace facilities where the low-voltage distribution system is "direct buried" in the street.

On August 30, 2001, the Company delivered an Accelerated Infrastructure Plan to the Town of Brookline that establishes a plan for implementing a series of system-upgrades and replacements on an accelerated basis. Similar to the steps taken in the City of Boston, this plan provides for infrastructure improvements to strengthen the reliability, and increase the capacity, of the distribution system within the Town of Brookline. Specifically, the Company has accelerated six projects in five areas within the Town of Brookline where recent outages were of particular concern (Coolidge Corner, St. Paul Street area, Brookline Country Club area, Newton Street area and Brookline Village).

In addition to the accelerated infrastructure plans, the Company has made a number of system-improvement commitments to nine municipalities outside the City of Boston.<sup>8</sup> In suburban areas, the electric distribution system is primarily an overhead system, which means that tree interference has an effect on the frequency of outages experienced by customers. Therefore, in these nine municipalities, the Company has committed to undertake a number of measures to improve system reliability, including tree trimming, increased use of infra-red surveys, underground cable testing, infrastructure improvements, system maintenance and capacity upgrades.

These municipalities are Arlington, Burlington, Lexington, Medfield, Millis, Newton, Sharon, Somerville and Stoneham. Company representatives have met personally with municipal officials to review the plans and discuss any concerns that the municipality may have.

In fact, the Company has made significant strides in resolving the system-performance issues that were experienced last summer. The Company is advancing its system implementation efforts and has instituted new business process to facilitate the flow of data within the Company and to ensure a higher utilization of existing resources. The Company has committed to a comprehensive plan of infrastructure improvements involving several communities within the service territory, which are designed to address local service issues and to reinforce the reliability of the system as a whole. The Company is confident that service reliability will improve as a result of these efforts.

F. Identification of Distribution System Design Flaws That Lead to Repeated Outages on Particular Circuits, Especially Circuits That Serve Critical Community Facilities

Based on both internal and external assessments, NSTAR Electric has determined that there are no fundamental technical flaws in the design of the distribution system or in the planning standards and guidelines that guide the Company's operation of the system. However, NSTAR Electric does have in place a program to convert over-burdened 4kV underground facilities to 13.8kV open-loop facilities throughout the distribution system.

The 4,160-volt ("4kV") distribution system is a radial-fed infrastructure (i.e., electricity flows in one direction), which supplies power to approximately 200,000 customers over roughly 390 circuits. This overhead and underground system, the bulk of which is centrally located in the city of Boston, has been utilized beyond its capacity in certain areas experiencing particularly high levels of load growth. In these areas, outages have the potential to occur in relation to the 4kV underground system, which has been the focus of the conversion project.

A summary of these infrastructure projects is provided as Attachment 6 to this Report.

Although the 4kV system is a valid design, especially at the time that it was introduced to the system, the current system conditions coupled with this older design has the potential to affect service reliability. The Company's assessment indicated that the focus of the 4kV replacement project needs to be systematically reviewed and adjusted in an effort to ensure that conversions are taking place in areas of particularly high load growth. For example, the need for stepped up 4kV replacement to meet particularly high load growth was identified in the Town of Brookline and areas within the City of Boston and the Company has developed plans to accelerate its efforts in these areas.

The underground segment of the 4kV system has approximately 275 circuits and serves approximately 130,000 customers. A disadvantage of the underground 4kV is that the radial design creates a burdensome process in locating failures, which negatively affects outage duration. Because no fuse protection exists, a failure on the 4kV system causes an entire circuit outage. This requires the Company to locate the source of the outage on a trial and error basis in the affected area, which causes customers to see their power come on and off several times during the process. In addition, the repairs are labor intensive and time consuming.

Several years ago, a creative design was developed that would replace the 4kV radial system with a new, modern 13.8kV open loop system. The open loop part of the design allows for power to be fed from two directions, allowing customers to be restored quickly in the event of a failure. Initially, the "4kV Modernization Project" was a 5-year, \$125M plan to convert 60 percent of the 4kV system to the open-loop model. In the beginning, the design of the program was to completely eliminate the substations in the area of concern. After the first phase, the Company determined that some of the assets

being converted did not have performance problems. Consequently, the Company shifted to a "worst circuit" method, which schedules the worst-performing circuits in any given year for conversion to the new 13.8kV system.

In 1999, the NSTAR Electric design team found an even more creative way to improve the reliability of the system for a greater number of customers and the same amount of money. This philosophy focuses on the conversion of 4kV underground facilities in poor-performing areas, not necessarily by converting entire circuits or substations. The 2001 work plan reflects a focus on the "worst performing areas," as well as the retirement of some substations, conversion of complete circuits, and conversion of a significant amount of partial circuits. Partial-circuit conversion is also beneficial due to the fact that customers who are not converted see reliability improvements because the circuit is carrying less electricity, which results in reduced failure risk.

The 4kV conversion project continues to be one of the most significant reliability improvement actions in the Company's work plan. As a result, we are continuously looking to improve this process. As indicated above, the Company has accelerated the conversion schedule in areas of high customer-load concentration, which often includes small commercial districts. Although the assets in some of these areas may not be currently under-performing, the Company's strategy is to replace the systems before repetitive problems occur.

The success of the 4kV conversion project will manifest itself in several ways. First, the reliability of service to customers will increase dramatically as new systems and equipment are installed. Secondly, corrective maintenance expenditures will be reduced,

and the working environment for employees improved, by the retirement of older equipment. Thus, the Company has made commitments to the City of Boston and the Town of Brookline with respect to the acceleration of 4kV replacement, which will have a significant impact on the overall reliability of service in those areas of the service territory.

# G. Accuracy of Weather Forecasting

NSTAR Electric relies on multiple resources to monitor and evaluate weather conditions. In the event of a weather-related contingency, NSTAR Electric has in place an SRP to guide the Company's response on both an external and internal basis. The Company has reviewed both its weather forecasting processes and its SRP implementation and determined that weather-forecasting practices were not a factor in the recent outages.

The Company subscribes to a weather-forecasting service provided by Weather Services Corporation. This weather service provides periodic weather forecast updates via electronic facsimile three times a day. The weather forecasts provided by this service provide a descriptive "Weather Summary," which includes details of precipitation type and amount, temperature and expected wind speed and direction. The forecast also includes a "Weather Forecast" section that typically looks out three days and also provides a summary of expected precipitation, temperature and wind conditions. These routine weather forecasts are occasionally supplemented by special weather bulletins, in the event of a severe weather situation. Typical bulletins include conditions such as severe thunderstorm activity, heavy snowfall, high winds, ice conditions. These faxed weather forecasts are received in the Company's System Control Center, located at

Massachusetts Avenue in Dorchester, which is staffed on a 24-hour, seven-day a week basis.

The on-duty Dispatch Supervisor is responsible for monitoring the forecasts and alerting operations personnel in the event that a threat arises. The Company also frequently supplements the published bulletins through direct communications with the staff meteorologists at the National Weather Service, who may be able to provide more specific details on pending threats. In addition to this service, the Company routinely monitors several different weather web sites for approaching weather systems and forecasts. The primary ones are Intellicast, Accuweather and the National Weather Service. Each of these services provides forecasts, radar imagery and precipitation tracking. These sites are routinely monitored throughout the day by Dispatch Supervisors when there is any type of approaching weather and usually provide accurate information when a weather system is moving closer to the Company's service territory.

There is usually a great deal of variation in the actual weather experienced for a particular storm and frequently weather will differ among the areas of Company's service territory. The Company has found that many storms change their characteristics as they approach the influence of the ocean. Sometimes this has the effect of diminishing thunderstorm activity and sometimes it actually increases it. Because the weather is such a dynamic and somewhat difficult element to predict, the Company believes that the strategy of consulting multiple sources of information increases its chance of making the appropriate threat assessment in the majority of the cases.

If a weather forecast or bulletin indicates a threat, the Company will typically supplement normal staffing levels proportionately to the threat and its geographic

dispersion. The Company has dispatchers and first responders (troubleshooters) on-duty around the clock. For a small or localized threat, the Company will typically double its troubleshooters and add extra dispatch staffing. For a moderate threat, the Company will keep line crews on duty after their normal shift or have them report back in at a predetermined time and add extra dispatch staffing. In the case of a severe or highly probable threat, the Company will increase troubleshooters and hold or schedule all line crews and supplement dispatch staffing. As outlined in the SRP (Appendix E), the Company also engages line contractors, service crews and other utilities in mutual aid response based on the threat assessment and/or damage incurred. Each threat assessment looks at the geographic exposure and crew staffing is supplemented in all locations as appropriate.

Accordingly, the Company believes that the current weather forecasting practices and procedures are sufficient to support utility operations in an effective manner.

H. Adequacy of Employee Staffing Levels for Operation and Maintenance of the Distribution System, Including Inspection Staffing Levels

Through its internal and external assessments, NSTAR Electric has determined that performance improvement opportunities exist in all areas of the Company's operations relating to the resources necessary to maintain service reliability and manage the outage process. In addition, because then-existing resource allocations were not aligned with the business process, a backlog developed in relation to corrective and preventive maintenance activities.

In the past two years, staffing resources have been affected by a number of factors that have required the diversion of staff to activities that are unrelated to system maintenance. Specifically, a significant level of human resources were diverted to

interconnection activities associated with new generation facilities, congestion mitigation and obligations associated with new customer connections, all of which are taking place at substantially increased levels as compared to historical levels. As a result of its internal and external assessments, the Company has re-prioritized its maintenance activities and has increased the level of internal resources devoted to system-maintenance activities in order to eliminate the backlog and comply with the annual preventive maintenance schedule going forward.

In addition, NSTAR Electric has implemented a number of measures to ensure that resources are appropriately allocated and that performance improvement opportunities are achieved by leveraging existing resources. Specifically, the Company has undertaken the following initiatives:

- Completion of core-system upgrades and training/re-training of personnel to increase utilization of available systems;
- Implementation of process changes to engage outside contractors;
- \* Improved planning and scheduling of human resources to meet re-prioritized work requirements;
- Improved planning for attrition; and
- \* Implementation of productivity performance standards to increase employee productivity.

In conjunction with its efforts to effect longer-term reengineering changes, the Company is taking immediate steps to ensure that reliability issues are addressed. Accordingly, the Company is seeking to fill approximately 100 new positions in the electric operations, shared services, customer care, asset management and information-systems areas. Taken in combination, these resource initiatives will substantially increase the productivity of the Company in relation to its service reliability and outage-management capabilities in the near term.

I. Identification and Description of All Training Programs for Employees Engaged in Electric Service Operation and Restoration Efforts

NSTAR Electric devotes a significant amount of time and resources to the training of its operational personnel in the areas of system maintenance and storm restoration. Specifically, NSTAR has a structured program for technical skills in the following craft areas:

- Overhead (320 employees, including supervisors)
- Underground (320 employees, including supervisors)
- Sub-stations (140 employees, including supervisors)
- Dispatch (48 employees, including supervisors)
- Meters (100 employees, including supervisors)

All union and management employees attend annual compliance training as required by the respective craft (approx. 9-12 programs per person depending on craft). All employees receive training for upgrades within their craft. Each craft has a structured program outlining the training program. Any employee changing craft areas receives apprentice training in that specific craft and supervisors and union-represented employees may request refresher training on an as-needed basis. The meter department and underground areas have structured training committees made up of both union and management employees to monitor training programs in their respective areas. A copy of the Company's electric-operations training manual is attached as Appendix G. The Company's specific operations training modules are as follows:

CRAFT AREA	LOCATION	PRIMARY USERS	SECONDARY USERS
Overhead	200 Calvary St. Waltham, MA	All Overhead Personnel	SRP crews Dispatchers Underground Troubleshooters
			Inspectors  Municipal Light, Fire,  Police
Underground	1165 Mass Ave. Dorchester, MA	Underground Troubleshooters Cable Inspectors Splicers	Supervisors Field Engineers Contractors
Cable & Conduit	1165 Mass Ave. Dorchester, MA	Cable & Conduit Installers URD Installers Conduit Inspectors	Supervisors Contractors
Computer Systems	1165 Mass Ave. Dorchester, MA	Office Administrators Electric Customer Service Designers Supervisors	Field Service Techs Field Service Reps Meter Testers/ Meter Installers
		•	Cost Performance Analysts GIS Operators
Sub-stations	1165 Mass Ave. Dorchester, MA	Operations & Maintenance Personnel Operators Substation Mechanics	Classes for anyone who requires entry into a sub-station
Dispatch	1165 Mass Ave. Dorchester, MA	Dispatchers	Overhead and Underground Personnel Troubleshooters Substations Operators Call Takers Supervisors Electric System Customer Service Designers Account Executives Major Customers Municipal Officials

CRAFT AREA	LOCATION	PRIMARY USERS	SECONDARY USERS
Metering	1165 Mass Ave. Dorchester, MA	Field Service Technicians Field Service Reps Meter Testers Collectors	Overhead and Underground Personnel Troubleshooters Phone Center Clerks Security Department Municipal Wiring Inspectors
Environmental	All Service Centers	All EO Personnel	All personnel involved in construction or decommissioning

J. Cost Benefit Assessment of Establishing a Program of Periodic Inspection of Both Above-Ground and Underground Distribution Plant to Be Conducted By Personnel Who Are Expressly Dedicated to Inspection

As described above, NSTAR Electric has established a comprehensive Preventive Maintenance Program (defined above as "PMP") that relies heavily on a periodic inspection process. The PMP is developed based on the preventive-maintenance guidelines that exist for each category of equipment involved in operating the transmission and distribution system (including both overhead and underground distribution facilities). The Company schedules equipment inspections and preventive-maintenance activities in accordance with the fixed-cycle periods reflected in the PMP. The design of the Company's PMP is a function of the Company's assessment of the costs and benefits associated with periodic inspections and preventive maintenance activities. The Company's current PMP is provided as Appendix F.

To implement the PMP, inspections must be performed by personnel who have the requisite knowledge of, and experience with, the components of the distribution system under inspection. Thus, the personnel that the Company designates to perform scheduled equipment inspections have significant experience in the operation of the component parts of the transmission and distribution system. In addition, each inspector is dedicated exclusively to the inspection of equipment for which he or she is certified for a portion of the year. When not performing such inspections, these personnel perform both corrective and preventive maintenance on the equipment in keeping with electric-system requirements and the PMP.

Based on experience with differing work processes, NSTAR Electric has not found it to be either feasible or cost beneficial to de-couple maintenance activities from inspection activities and to devote a category of personnel exclusively to inspection activities. Few individuals possess the knowledge or experience in the operation of all of the various types of equipment used to operate the distribution system. Therefore, Company personnel are certified to perform inspections and to undertake maintenance activities on the equipment with which they have the requisite knowledge and experience. In the Company's experience, this combined inspection/maintenance work process is an efficient and effective approach that best leverages the expertise of the Company's experienced work force.

# V. Reliability Improvement Initiatives

Throughout its effort to perform an "unflinching" self-examination of the factors that contributed to the outages this past summer, NSTAR Electric has kept its focus on one key principle: NSTAR Electric is in the business of delivering reliable electric service to its customers. The Company will successfully achieve this objective by providing dependable service, by demonstrating urgency and competency in its restoration efforts during periods of service interruptions and by facilitating the internal

and external flow of prompt and accurate information both about distribution-system conditions.

In the past few months, the Company has implemented a series of organizational changes to improve the way that the electric system operates. These improvements are focused on system infrastructure, business processes, information systems and people, because it is these resources that the Company relies upon in providing reliable service to customers. The Company's initiatives are discussed in detail above in response to the Department's system-performance questions and in the Descriptive Overview of the Internal Assessment Project (Appendix A). However, the Company's action plan can be summarized as follows:

# (1) <u>SYSTEM INFRASTRUCTURE</u>

The Company is now implementing a plan to identify, prioritize and eliminate the corrective maintenance backlog and to ensure that the 2001 preventive maintenance schedule is achieved. To accomplish this, the Company has revised its staffing plans to direct more resources to system-maintenance activities. In addition, the Company has accelerated 4kV underground conversions and other infrastructure improvements in "hot spot" areas in the City of Boston, the Town of Brookline and other municipalities experiencing particularly severe service outages this past summer. The Company has also established processes to ensure that reported system-performance statistics are complete and accurate and will be reflected in system-maintenance plans on a going forward basis.

## (2) BUSINESS PROCESSES

The Company is working to improve its outage-management process through the completion of system-implementation efforts and the alignment of business processes with those systems. Written, standardized business procedures are being developed and implemented to align processes and people with the appropriate information-system requirements and capabilities. User-friendly interfaces are being developed to assist employees in the design and production of outage-management reports. The Company is working to develop or enhance a number of operating procedures to ensure the availability and accuracy of outage information and restoration status reports. In addition, efforts are underway to establish guidelines and standards to predict staffing needs and to trigger an escalation of response to localized events. The Company has also enhanced its external communication plans to provide outage information to outside constituencies.

### (3) <u>INFORMATION SYSTEMS</u>

The Company is moving ahead aggressively with its systems implementation efforts with a strong focus on the M3i system, which will significantly improve the Company's flow of outage information. The Company is on track to complete a significant phase of the M3i implementation process on the Boston Edison system by April 2002. In addition, the Company will implement a number of measures to improve the quality of data resident in core information systems. The Company will also institute a series of reporting initiatives to improve the information provided to management and to enable business processes. Users will be trained or re-trained to work within established business processes.

#### (4) PEOPLE

The Company is in the process of hiring approximately 100 new employees in the areas of electric operations, shared services, customer care, asset management and information-systems areas to meet business needs in the short term. The Company is also pursuing a series of performance-improvement opportunities to leverage existing resources and to achieve greater efficiency in its distribution operations in the long-term. The Company is looking at ways to better train employees, especially with respect to newly implemented information systems and is putting in place plans to train and re-train employees so that they have the ability to use the available systems to the maximum capability with a high level of accuracy.

#### VI. Conclusion

The intensive self-evaluation that NSTAR Electric has undertaken since last July has enabled the Company to develop and put in place an action plan that represents a broad, operation-wide alignment of system infrastructure, business processes, information systems and people to ensure that customers experience a higher level of service reliability next summer and in the longer term. NSTAR Electric looks forward to working with the Department and others in this proceeding as its efforts to implement this action plan move forward.